



A project by Ford Australia, Deakin University and Griffith University

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<https://100jobsofthefuture.com/>

100 JOBS OF THE FUTURE

WHAT WILL WORK LOOK LIKE IN THE FUTURE?

If you are entering the workforce now you may have many jobs and even multiple careers over a lifetime! The future of work will involve people collaborating effectively with machines to do what neither can do alone. What jobs will be created in the future that don't currently exist? How can we prepare for future jobs? What skills will be needed?

THE AIMS OF THE PROJECT

100 Jobs of the Future is a research project that aims to look at the future of work in an increasingly technologically-driven society. We investigated:

- major trends and issues associated with major drivers of change – technological disruption, scientific innovation, climate change, globalisation, and population changes;
- the changes in work that will occur in key industries and domains;
- the jobs that will emerge in the future as a result of these changes; and
- the skills and interests that are needed for these jobs.

Having identified 100 jobs that represent key work futures in major domains and industries, we have designed a 'job explorer tool' called the Future Job Quiz, to help young people think about work futures, and how their aptitudes, career interests and skills might lead them towards these jobs.



Nanomedical Engineer



Cyborg Psychologist

THE PROJECT DESIGN

1. First, we looked at the research and writing around work futures – major reports, research papers, books by futurologists - to identify major trends and the implications of these for work in the next few decades.
2. Next, from this review we identified key domains such as agriculture, health, and games which are changing rapidly, and selected 11 experts familiar with cutting edge developments in these domains, who could tell us about trends, and future jobs.
3. We interviewed these experts, and from this constructed a picture of what future work would look like generally, and identified, using their testimony accompanied by more web-based exploration, 100 jobs that represent a picture of future work in these key domains.
4. Finally, drawing on the research report, we constructed the 'job explorer tool' to help young people think about future work, and how their aptitudes, career interests and skills might lead to interesting 'jobs of the future'.

THE SKILLS OF THE FUTURE

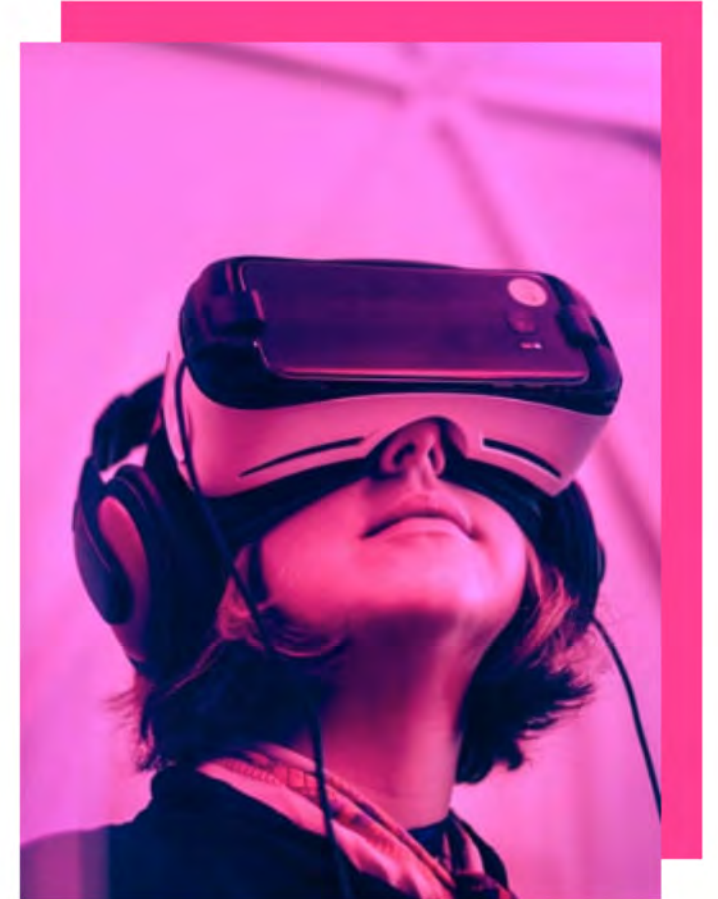
“ 58% of students aged under 25 years in Australia (are) enrolled in fields of study that will be radically affected by automation in the next 10-15 years. If we focus just on VET students, the proportion of students being trained in the at-risk occupations rises to a significant 71%. ... Such jobs include woods trades, horticulture, and printing.

The New Work Order. Foundation for Young Australians, 2017b, p.25

- Shift from routine to non-routine skills
- Entrepreneurial skills
- STEM, STEAM and digital skills
- Problem solving
- Interpersonal skills
- Creativity
- Manual dexterity
- Lifelong learning

“ The future of work will be primarily about how people can collaborate effectively with machines to do what neither can do alone.

Commonwealth Bank jobs and skills of the future report, 2017, p.12



Report	Trends	Future Skills
Australian Reports		
The Commonwealth Bank Jobs and Skills of the Future Report	Ageing Population, Advances in Artificial Intelligence, Cloud Computing, Automation – shift from resources to higher skilled, service-based economy. A shortage of STEM skills is a current problem.	Creativity , Relationships, Adaptability, Design, Analysis, Technology, Learning, Entrepreneurial
FYA The New Work Smarts Report	Less routine tasks, but more interpersonal skills and technology enabled skills	Lifelong learning, problems solving/analysis, critical thinking, verbal communication, STEM, Entrepreneurial
CSIRO: Tomorrow's Digitally Enabled Workforce	Change drivers are: device connectivity, data volumes, computational speed, automation, A.I., Internet of Things, peer-to-peer, portfolio workers, ageing population ...	Overall, the main skills are seen as: entrepreneurial, STEM, creativity , lifelong learning (of concepts, rather than specific skills), digital literacy, social interaction skills, resilience
CEDA Australia's Future Workforce?	Cloud services, internet of things, big data, AI and Robots, immersive communications, globalisation, hollowed workplaces, ageing population, self-employment	ICT (which will be added as core to literacy and numeracy), tension between job-ready and broad based competencies, need for reskilling,
The New Work Smarts (fya 2017b)	Automation and globalisation are going to impact all jobs, there are no safe jobs.	A reduction in work roles that do routine manual tasks and an increase in those that involve 'focusing on people, solving strategic problems and thinking creatively ' – where workers will spend more time learning on the job, solving problems, critical thinking, using science, maths and verbal communication, and be more entrepreneurial.
The New Work Order: Ensuring young Australians have skills and experience for the jobs of the future, not the past. (fya 2017a)	The three major drivers of change are automation, globalisation and collaboration.	The major skills young people need to compete in the new economy are digital literacy, enterprise skills and entrepreneurship . Routine tasks are seen as highly exposed to automation, both manual and cognitive jobs. As such, the skills needed for future jobs are non-routine manual and cognitive occupations.
The Automation Advantage: (AlphaBeta 2017)	potential for economic growth, improved living standards, better and more interesting jobs that will come from the adoption of automation within Australia.	The report focuses on the likely changes automation will bring to six skill categories: interpersonal tasks, creativity and decision making , information synthesis, information analysis, predictable physical tasks and unpredictable physical tasks.
The New Work Basics: big data reveals the skills young people need for the New Work Order (Fya 2017)		Enterprise skills are transferable between jobs and include: problem solving, creativity , communications, teamwork, financial literacy, digital literacy, critical thinking and presentation skills (p.4)
Australian Jobs 2018 (Dept Jobs and Small Business 2018)		the average working week in 2030 predicted to consist of an additional 2 hours a week of interpersonal, information synthesis and creativity and decision making , while there will be a similar decline in automatable tasks.

CREATIVITY

Creativity is also particularly difficult to program a computer to achieve. This is because creativity, by definition, produces something that is new, novel and therefore something that cannot be fully predetermined in code beforehand. In that sense, a truly creative outcome is one that can only be recognised at the end of the process when looking back — computers are rules based and creativity could be virtually defined as the very opposite of that.

“Creativity: Value will not come from the old ways, only the new, making imagination and creativity central to tomorrow’s capabilities.

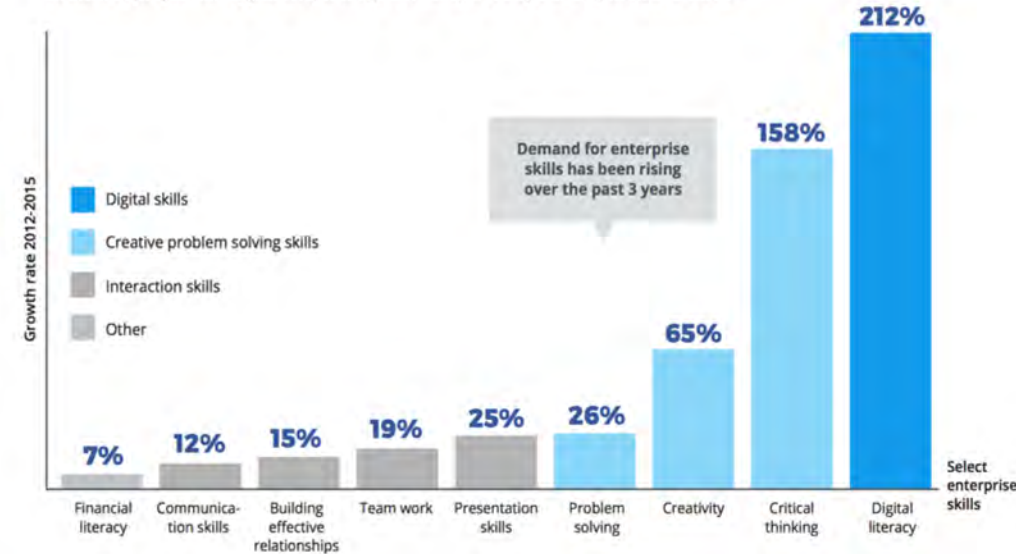
Commonwealth Bank jobs and skills of the future report 2017, p.17

However, creativity is not just about producing something that is novel or unexpected. A creative solution to a problem also needs to be ‘right’ in the sense that it needs to provide a positive solution to the problem at hand. Creativity skills are growing in demand. “A 2016 World Economic Forum report estimates that five years from now, more than a third of skills considered important today will no longer be relevant. Creativity and emotional intelligence will be among the top three needed” (Riad, 2017, p.18).

Allied with this, commentators predict a “low susceptibility of engineering and science occupations to computerisation’ since they require a ‘high degree of creative intelligence” (Frey & Osborne, 2013, p.44).

Exhibit 2: Recent growth in demand for select enterprise skills

Growth in proportion of jobs requesting each skill, %, early-career jobs, 2012-2015¹²



MEET THE EXPERTS



Megan Brownlow
Pricewaterhouse
Coopers



Sheryl Connelly
Ford Motor Company



**Mark Harvey-
Sutton**
National Farmers
Federation



Daniel Johnson
Queensland University
of Technology



Ivan Neville
Department of Jobs



David Ramadge
eBay



Ben Rogers
National Farmers
Federation



Susan Thompson
City Futures Research
Centre



Jude Walker
FutureWorking



Xungai Wang
Deakin University -
Institute for Frontier
Materials



Sally Ann Williams
Google Australia



Ethics Officer

KEY FINDINGS

The world of work will change dramatically in the next few decades. Even now, jobs are changing at a fast rate as machines and big data change the way we work and interact with each other.

An aging population, medical technologies, and disrupted workplaces will change people's life spans and career patterns. Climate change, population pressures and technologised lifestyles will throw up major challenges for sustainability. New technologies and new materials will change agricultural practice, transport, engineering, and industry and business practices.

This will all lead to major work disruptions, but open up possibilities for those with the skills and interests to match. Increasingly, jobs will involve humans working with machines, which means that future work will require people with technical/digital skills and those who can work at the interface between machines and people. We will have new jobs, and the jobs that exist now will change to include new technological and communication processes.

Many, but not all, of the 100 jobs of the future will require scientific and technological and digital skills. Many also require people skills, creativity and imagination, and the ability to work across domains and to learn and adapt.

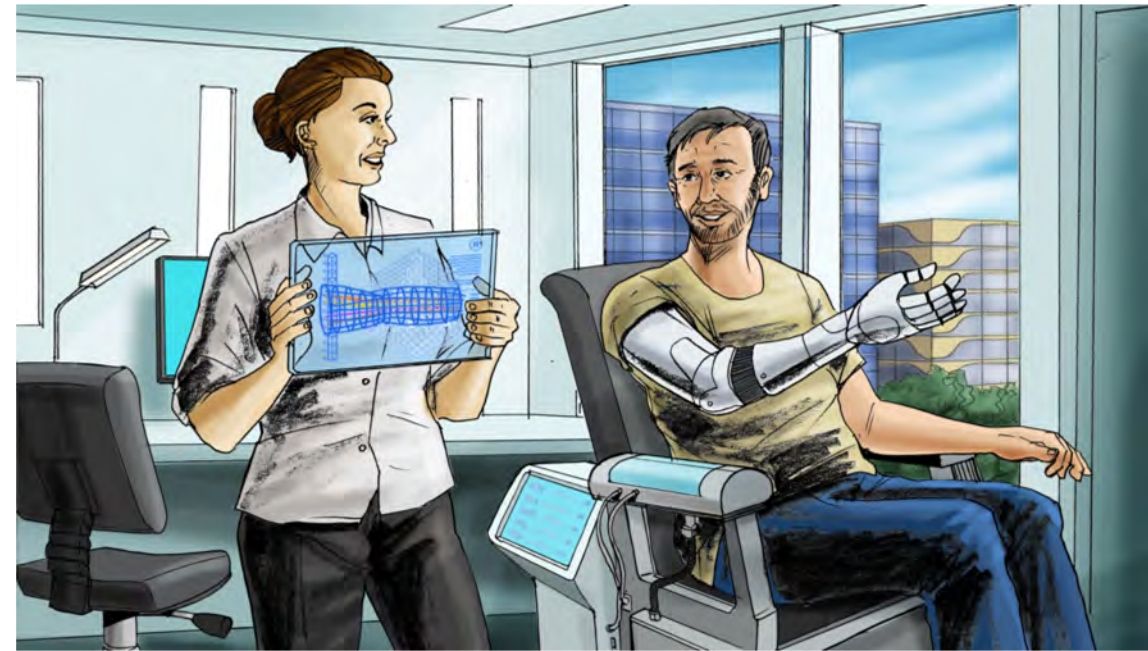
Skills for future work: 3 themes

1. Cross disciplinaryity

- People having deep knowledge of one area supplemented with wider knowledge to support working in cross-disciplinary teams
- People marrying disciplinary knowledge with knowledge of technology in order to understand the meaning of data, and of data needs
- People being able to work across disciplinary ideas, for instance in STEM, and technology, but with a creative orientation: 'learn how to code, and learn how to paint'.

2. Interpersonal skills: working at the technology-human interface, working in teams, community and citizenship skills

3. Flexibility and adaptability, capacity to learn and be strategic about learning



Setting the future context



In the future, driving will be optional as autonomous vehicles become more affordable and varied, leading to extended choice in forms of mobility.

As a result, the car as a transit experience will be redesigned. The basic car unit will be made up of a chassis with an electric drive-train and autonomous driving electronics.

The nature of the job



An autonomous vehicle profile designer designs the cabin that will fit on top of the basic car unit. Each cabin will need to transform into multiple possible configurations, including bedroom, dining room, conference room, playroom, and gym (amongst others).

The autonomous vehicle profile designer will also skin the inside and outside of cars that is, uses augmented reality overlays to make the cars' look and feel reflect the personality and visual preferences of their owners. A car's skin will become an extension of its owner's personal avatar.

The skills needed



Autonomous vehicle profile designer will have a background in interior and industrial design, and possess excellent creative and visual artistic skills. They will have knowledge of the properties of new materials that are being produced, such as transparent aluminium. They will be experienced in computer-aided design and the use of augmented reality engines.

Constructing the jobs

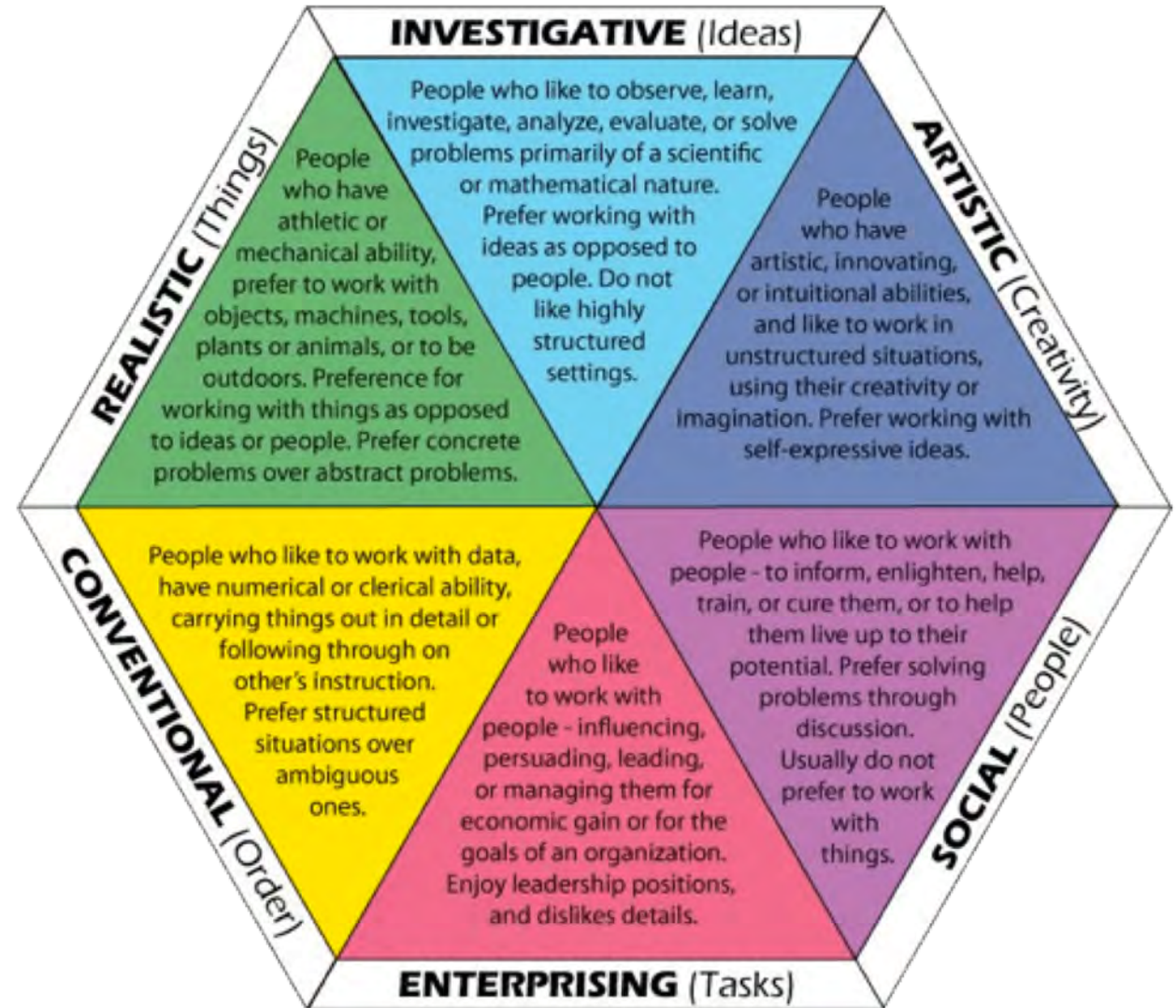


HOW WE CONSTRUCTED THE JOBS EXPLORER TOOL

1. To construct the Jobs Explorer tool, we first identified the aptitudes, skill sets and career interests that matched each job. For these, we used the 'Holland code' typology which has been well researched and tested, identifying 6 'codes' to characterise peoples' major career interests.
2. Next, we designed an online quiz that identifies a code profile for each participant – Practical, Investigative, Social, Creative, Enterprising, Organised.
3. We divided the 100 jobs into 19 areas of work, such as 'advanced farming and food production', 'leisure and entertainment', or 'digital networks'.
4. Together with a preference for these areas of work, the coding enables us to identify future jobs matched to the responses.
5. Finally, we included in the advice for young people to further explore possible job futures linked to their profile, and the future jobs.



RIASEC codes



Artistic jobs

Job Title	RIASEC code	Job category	new	Artistic
Fusionist	A, S	buslaw	new	A1
Food knowledge communicator	A	ex	new	A1
Media remixer	A, E	ex		A1
Multisensory experience designer	A, I	ex		A1
Swarm artist	A, E	ex		A1
Virtual and augmented reality experience creator	A, S,	ex		A1
Nutri-gutome consultant	A, I, C	health		A1
Drone experience designer	A, S, I, C	people	new	A1
Personal brand manager & content curator	A, S	people		A1
Offworld habitat designer	A, I	space	new	A1
Gamification designer	A, I	tech		A1
Autonomous vehicle profile designer	A, I	urban	new	A1
Human habitat designer	A, I, C	urban		A1
Net positive architect	A, I, C	urban	new	A1
Innovation manager	E, A, S	buslaw		A2
Virtual assistant personality designer	S, A	ex	new	A2
Aesthetician	S, A	people		A2
Nostalgist	S, A, I	people	new	A2
Additive manufacturing engineer	I, A	tech		A2
Digital implant designer	I, A, S	tech	new	A2
Ethical hacker	I, A	tech		A2
Massive 3D printed building designer	I, A	urban	new	A2
Personalised marketer	E, S, A, I	buslaw		A3
Aged persons climate solutions consultant	S, I, A	env	new	A3
Biomimicry innovator	I, E, A	tech	new	A3
Agroecological farmer	R, C	ag		
Bio-jacker	I, C	ag	new	
Cricket farmer	R, C	ag		
Farm safety advisor	C, I	ag	new	
AI intellectual property negotiator	E, S	buslaw		
Blockchain talent analyst	I, S	buslaw		
Chief ethics officer	I, S	buslaw		
Community farm finance broker	E, I, S	buslaw	new	
Drone airspace regulator	C, I	buslaw		

Nostalgist



What will future work look like for you?

In the future, could you be a robot ethicist? An offworld habitat designer? A personal brand manager? A biofilm plumber? A smart dust wrangler?

Everyone has characteristics that make them unique. Different people have different combinations of interests, aptitudes, and skills.

This job explorer tool has been designed to identify some of your career interests and aptitudes. It is not a fully detailed assessment — while you may have stronger interests in some areas than in others, you may also find that you can relate to more than one.

On the basis of your answers, the job explorer will recommend some of the '100 Jobs of the Future' that may be a fit for you.

Take the quiz ▶

<https://100jobsofthefuture.com/quiz/>

Order these statements from most like you at the top, to least like you at the bottom:

Drag and drop to reorder

I enjoy making or fixing things with my hands, using tools and equipment

I enjoy reading and thinking about solutions to problems

I enjoy using my artistic and creative talents

I enjoy teaching or helping others

I enjoy being in charge, leading and persuading others

I enjoy keeping records and organising things



Next >



Here is a list of areas of future work.

Select 2 to 3 to explore examples of future jobs in those areas

<input type="checkbox"/> Strengthening local communities and neighbourhoods	?	<input type="checkbox"/> Personalising information and communication	?	<input type="checkbox"/> Advanced farming and food production	?
<input type="checkbox"/> Leisure and entertainment	?	<input type="checkbox"/> Extended lifespans	?	<input type="checkbox"/> Education and lifelong learning	?
<input type="checkbox"/> Law and ethics	?	<input type="checkbox"/> Health and wellbeing	?	<input type="checkbox"/> Scientific discovery	?
<input type="checkbox"/> Environmental restoration and renewal	?	<input type="checkbox"/> Advanced city design	?	<input type="checkbox"/> Business innovation	?
<input type="checkbox"/> Space exploration	?	<input type="checkbox"/> Micro- and nano-technology	?	<input type="checkbox"/> Virtual and augmented reality	?
<input type="checkbox"/> Robotics and drones	?	<input type="checkbox"/> Artificial intelligence	?	<input type="checkbox"/> Digital networks	?



EXPLORE



During the early Anthropocene (the geological period during which human activity started to be the dominant influence on climate and the environment, before ecology restoration began), many species of animals and plants became extinct.

About 40% of bird species, 30% of amphibians, and 55% of insect species disappeared during this time.

Thankfully, governments realised the importance of healthy environments, and ecology restoration became a priority activity globally.

Most de-extinction and conservation geneticists work with ecology restoration workers to rebalance ecosystems. Some work in agriculture. However, some de-extinction and conservation geneticists work in novelty areas, bringing dinosaurs, aurochs, Tasmanian tigers and woolly mammoths back to life for wealthy people who want to own them as pets. This is a controversial area of de-extinction genetics, as reintroduction of extinct animals and plants can lead to harm to modern species, and cause imbalance in ecosystems.

De-extinction and conservation geneticists will have strong analytical, critical thinking, and problem solving skills. They will be good at maths and research, and have advanced qualifications in life sciences, genetics and the species they specialise in.

OECD: Framing STEM knowledge and skills

Knowledge	
<ul style="list-style-type: none"> • Disciplinary knowledge 	Concepts such as energy, geometric relations, material and structural properties, ecosystem principles ...
<ul style="list-style-type: none"> • Epistemic knowledge 	How knowledge is built in the STEM disciplines, social and personal settings of STEM knowledge building, nature of models in maths and science, design processes, algorithmic coding processes ...
<ul style="list-style-type: none"> • Interdisciplinary knowledge 	Interdisciplinary processes, links between mathematics and science, technology, STEM and other knowledges- societal, humanities and arts ...
<ul style="list-style-type: none"> • Procedural knowledge 	Investigative and problem solving approaches, design knowledge, coding knowledge ...
Skills	
<ul style="list-style-type: none"> • Cognitive / metacognitive 	Complex and creative problem solving, design thinking, critical thinking, systems analysis, computational skills, complex, model based reasoning ...
<ul style="list-style-type: none"> • Social / emotional 	Interpersonal skills, cooperation/ collaboration, persistence and optimism ...
<ul style="list-style-type: none"> • Physical / practical 	Technical skills, coding, manipulation ...
Attitudes	Productive disposition, curiosity, aesthetic preferences, open mindedness, respect for evidence, commitment to learning ...
Values	Care for animals, objectivity, cooperation, responsibility ... (Personal-global)

Representational and modeling practices, not the forms of logic or reasoning that are more frequently focused on by psychological investigators, are the defining features of scientific thinking (Nersessian, 2002, in Lehrer & Schauble, 2006)

Visualization in science involves objects that *combine visual and non-visual elements because scientific work requires representations that are hybrid (that combine verbal or symbolic expressions with visual and other sensory modalities) and plastic, enabling the meaning of an image, word or symbol to be negotiated and fixed (Gooding, 2006, p. 40)*

[Home](#) > [About Deakin](#) > [Events](#) > Art, visualisation and the cosmos in education

Art, visualisation and the cosmos in education

5-6 December 2019
Deakin Downtown



<https://deakinsteme.org/event/art-visualisation-and-the-cosmos-in-education/>

Art and science: Theatre in a suitcase

Trash puppet: Northern corroboree frog



Student A: So we originally wanted to make it the actual size which is 2.5-3cm cm long but we decided because they were going to be really small we want to make it bigger and animate it for the little kids (their audience).

Student B: And also we started off thinking it would hop and we were trying to add that in, then we did a lot more research and learnt actually we found out that they walked and then we tried a few different things and it just sort of came along together.

Student C: Yea we probably did it the wrong way around - we were told what we would be doing and it seemed awesome, so we had this great idea in our head and went to draw and construct an image, and it was an upright frog that could hop and do all that. Then we thought "we need to stop, go back and do some research" and after that we got a feel for how the frog actually moves and I suppose characteristics of the frog that are unique; They've got a bumpy back but a smooth tummy and they walk and don't hop and they have these really unique stripes and each species has a unique colour. So that contributed to our final plan and then we had people from the Trash Puppets (workshop) come in and help us with the actual making of the puppet




Photographic exhibition: Optics effects that intrigue and surprise



In this photo we utilized the mirrors to create a repeating effect with the mannequin

The reflections in the mirror give a virtual image and you can't work out where the real mannequin ends and the virtual image begins



VLAD PETRE GLAVEANU
MICHAEL HANCHETT HANSON
JOHN BAER
BAPTISTE BARBOT 
EDWARD P. CLAPP
GIOVANNI EMANUELE CORAZZA
BETH HENNESSEY
JAMES C. KAUFMAN 
IZABELA LEBUDA
TODD LUBART
ALFONSO MONTUORI
INGUNN J. NESS
JONATHAN PLUCKER
RONI REITER-PALMON 
ZAYDA SIERRA
DEAN KEITH SIMONTON
MONICA SOUZA NEVES-PEREIRA
ROBERT J. STERNBERG

Commentary

**Advancing Creativity Theory and Research: A
Socio-cultural Manifesto**

- Creativity is, at once, a psychological, social, and material phenomenon
- Creativity is culturally mediated action
- Creative action is, at all times, relational
- Creativity is meaningful
- Creativity is fundamental for society
- Creativity is dynamic in both its meaning and practice
- Creativity is situated but its expression displays both similarities and differences across situations and across domains
- Creativity needs specification
- Creativity research needs to consider power dynamics both within our analyses and as a field of study
- The field of creativity studies needs both quantitative and qualitative methodologies with strong theoretical grounding
- Old literature should be revisited and not abandoned
- Creativity researchers have a social responsibility

Thank you

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